



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/607,224	06/26/2003	David L. Adler	10011.001610(P1099)	5910

31894 7590 12/22/2003

OKAMOTO & BENEDICTO, LLP
P.O. BOX 641330
SAN JOSE, CA 95164

EXAMINER

LEYBOURNE, JAMES J

ART UNIT	PAPER NUMBER
----------	--------------

2881

DATE MAILED: 12/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/607,224	Applicant(s) ADLER ET AL.	
	Examiner James J. Leybourne	Art Unit 2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on _____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 29-37 is/are allowed.
- 6) ☒ Claim(s) 1-14 and 16-28 is/are rejected.
- 7) ☒ Claim(s) 15 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 June 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>121103</u> | 6) <input type="checkbox"/> Other: |

DETAILED ACTION

Claim Objections

1. Claim 17 objected to because of the following informalities: Claim 17 recites the limitation "the selected energy range" in line 1-2. There is insufficient antecedent basis for this limitation in the claim.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 25 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The phrase "group of devices including" does not define what other devices are included in the group.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-3, 6-13, 18-23 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nozoe et al. (USPN 6583414). Figure 2 shows an inspection/review system that comprises an electron beam generator **28**, optics that impinge a primary beam **52** onto a sample **53**, a secondary electron detector **33** and an energy filter **55**. A "voltage contrast mode" is provided wherein only secondary electrons of energy larger than a predetermined energy (threshold) are detected in order to obtain voltage contrast information (column 5, lines 43-47 and column 6, lines 29-36). An image is stored and an image processing unit **49** extracts characteristics of defects from the image information and automatically classifies and records the defects (column 14, lines 16-19). In an automatic defect inspection and classification system, it is inherent that rules such as critical dimensions will be used to classify the defects. As known in the art, it would be obvious to use reference data on the locations of features in a die being inspected in order to detect missing features. The inspection system includes an automatic wafer handling system **23** so that a plurality of wafers can be automatically reviewed sequentially (column 20, lines 24-25).

Regarding claim 23, Nozoe et al. teach in the figure review mode, the electron beam radiating energy during the review period is set to 800V to 1 kV (column 16, lines 58-59).

4. Claims 4, 5, and 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Toro-Lira et al. (USPN 5493116). Toro-Lira et al. disclose an electron bean inspection system that utilizes two detectors and angular filtering to discriminate between electrons from the top surface and bottom surface of high aspect ratio features. As seen in FIG. 7, the lower detector receives backscatter emission of electrons in one solid angle and the upper detector receives backscatter electrons in a different solid angle. The geometry of FIG. 7 accomplishes a spatial filtering whereby backscattered electrons and secondary emission electrons are discriminated from one another and imaged on the upper and lower detectors, respectively, to achieve top and base biased imaging (column 5, lines 16-46). As seen from Fig. 7., the lower aperture in lower detector L.D. comprises an entrance pupil for the upper detector.

5. Claims 14 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nozoe et al. as applied to claim 1 in view of Lo et al. (USPN 6232787). Nozoe et al. do not teach controlling the charging of a specimen being inspected. In Fig. 7, Lo et al. teach a method of inspecting high aspect ratio features comprising charging the microstructure (step 705) and interrogating the charged structure with a charged-particle beam (step 710). The wafer can be charged up by directing electrons from a

flood gun or primary beam toward a surface of the wafer and/or by setting potential of an energy filter so as to direct secondary electrons back to the wafer while directing a charged-particle beam at the wafer (column 2, lines 36-40). It would be obvious to one of ordinary skill in the art at the time of the invention to modify the system of Nozoe et al. to include the capability to charge the specimen as taught by Lo et al. because Lo et al. teach, improved methods and apparatus are needed for detection of defects in microstructures and especially in semiconductor wafers carrying portions of microcircuits in fabrication (column 2, lines 16-19).

6. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nozoe et al. as applied to claim 1 in view of Rein horn et al. (USPN 6317514). Nozoe et al. do not teach using a photon beam as the primary beam. Reinhorn et al. disclose a method and apparatus for inspection of patterned semiconductor wafers using a light beam. As the light beam impinges upon metal at the bottom of a contact hole or via, electrons are emitted and detected by the detector 27. When the contact hole is partially blocked fewer electrons will be emitted, and an alarm may be issued. The investigation of the signal can be done using methods such as a threshold.

It would be obvious to one of ordinary skill in the art to substitute a photon beam for the electron beam or Nozoe for applications where it is desirable to determine if the material at the bottom of a via is metal because Reinhorn et al. teach that one of the physical parameters that distinguishes metals from insulators is their work function.

Allowable Subject Matter

7. Claims 29-37 are allowed.

8. The following is an examiner's statement of reasons for allowance:

With respect to the independent claims 29 and 34, prior art fails to disclose or make obvious a method or apparatus for energy-filtered electron beam inspection that comprises capturing a first image using electrons with energy above a first threshold, capturing a second image using electrons with energy above a second threshold and subtracting one of the images from the other image to create an image with electrons in an energy bandpass.

Claims 30-33 and 35-37 are allowed by virtue of their dependency on claims 29 and 34 respectively.

9. Claim 15 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Regarding claim 15, although it is known that a photon beam can be used to eject photoelectrons from a specimen, the prior art has not disclosed or made obvious using a photon beam as an auxiliary beam to provide charge control in an examining system that uses a primary beam to generate scattered electrons due to impingement of the primary beam onto a specimen.

10. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance".

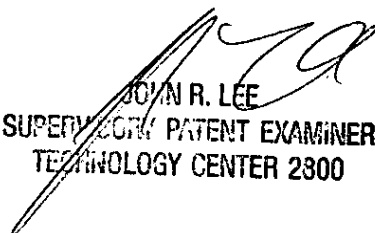
Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to James J. Leybourne whose telephone number is (703) 305-7067. The examiner can normally be reached on M-F 9:00- 6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R Lee can be reached on (703) 308-4116. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9319.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-7060.

December 11, 2003
JJL


JOHN R. LEE
SUPERVISING PATENT EXAMINER
TECHNOLOGY CENTER 2800